UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/650,026	08/26/2003	Yoshihumi Suzuki	501315.20004	6447

7590 10/14/2005

Eugene LeDonne
Reed Smith, LLP
29th Floor
599 Lexington Avenue
New York, NY 10022

EXAMINER	
MRUK, GEOFFREY S	

ART UNIT	PAPER NUMBER
2853	

DATE MAILED: 10/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/650,026	SUZUKI, YOSHIHUMI	
	Examiner	Art Unit	
	Geoffrey Mruk	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 9-15, and 19-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Sakaida (US 6,174,051 B1).

With respect to claim 1, Sakaida discloses an inkjet head (Fig. 1, element 5) comprising:

- a cavity unit (Fig. 5, element 32) formed of a conductive material (Fig. 5, element 38) with a plurality of nozzles (Column 8, lines 2-5) and a plurality of pressure chambers (Fig. 5, element 31) in fluid communication with the corresponding nozzles; and
- an actuator (Fig. 5, element 33) including a plurality of sheet members (Fig. 4, elements 33A-33C) laminated one on the other in a stacked direction,
- a plurality of drive electrodes (Fig. 5, element 36) corresponding to the pressure chambers, and a plurality of common electrodes (Fig. 5, elements 37, 38), the plurality of drive electrodes and the plurality of common electrodes being arranged in alternation with respect to the stacked direction (Column 10, lines 5-

9), each of the drive electrodes and the common electrodes being sandwiched between corresponding sheet members (Column 10, lines 5-9),

- wherein portions of the sheet members sandwiched between the drive electrodes and the common electrodes serve as active portions that selectively eject ink droplets from the corresponding pressure chambers through the nozzles (Column 10, lines 26-59),
- wherein projected contours of all the drive electrodes (Fig. 5, element 36) fall within a projected contour of one of the common electrodes (Fig. 5, element 38) disposed closest to the cavity unit (Fig. 5, element 32) with respect to the stacked direction.

Although figures 4 and 5 do not explicitly show a third direction, the projected contours of all the drive electrodes fall within the projected contour of a common electrode (Fig. 5, element 38) since "an array 30 of the piezoelectric ink jet head 5 is constructed of a cavity plate 32 in which a plurality of ink pressure chambers 31 whose top planes are open are formed, a piezoelectric ceramic layer 40 fixed on the cavity plate 32 with adhesive agent so as to cover each open plane of the ink pressure chambers 31, an outer piezoelectric ceramic layer 34 stacked on the upper plane of the piezoelectric ceramic layer 40, and a laminated piezoelectric element 33 stacked on the upper plane of the outer piezoelectric ceramic layer 34. It is noted that the piezoelectric ceramic layer 40, the outer piezoelectric ceramic layer 34, and the laminated piezoelectric element 33 are individually explained for convenience in the embodiment,

whereas they are actually formed in an integral body" (Column 8, lines 67-67; Column 9, lines 1-11).

With respect to claim 2, Sakaida discloses the plurality of pressure chambers (Fig. 5, element 31) are aligned in a first direction perpendicular to the stacked direction;

- each of the drive electrodes (Fig. 5, element 36) has a length greater than the corresponding pressure chamber in a second direction perpendicular to both the first direction and the stacked direction,
- each drive electrode (Fig. 5, element 36) having a protruding portion protruding beyond the pressure chamber in the second direction,
- the sheet members include first sheet members (Fig. 4, element 33A) and second sheet members (Fig. 4, element 33B), each first sheet member being provided with the drive electrodes (Fig. 4, element 36) on a surface, each second sheet member being provided with one of the common electrodes (Fig. 4, element 37) on a surface;
- the actuator further includes a plurality of dummy drive electrodes (Fig. 4, element 37) and conductive members, the plurality of dummy drive electrodes being formed on the surface of each second sheet member (Fig. 4, element 33B), except the second sheet member closest to the cavity unit, and
- corresponding to the protruding portions of the drive electrodes (Fig. 4, element 36), the conductive members (Fig. 4, electric circuit) extending in the stacked direction to electrically connect the dummy drive electrodes to the corresponding protruding portions; and

- the projected contours of all the drive electrodes (Fig. 4, element 36) including the protruding portions fall within the projected contour of the one of the common electrodes (Fig. 4, element 38) disposed closest to the cavity unit (Fig. 4, element 32) with respect to the stacked direction.

With respect to claim 3, Sakaida discloses the common electrodes (Fig. 5, elements 37, 38) have at least one lead-out portion (Fig. 4, electric circuit connections), and

- the actuator (Fig. 5, element 30) further includes a plurality of dummy common electrodes (Fig. 5, element 37) each formed on the surface of each first sheet member (Fig. 4, element 33A) to correspond to the lead-out portions of the common electrodes (Fig. 5, electric circuit connections),
- the conductive members extending in the stacked direction to electrically connect (Fig. 5, element GND) the dummy common electrodes to the lead-out portions of the common electrodes.

With respect to claim 4, Sakaida discloses the plurality of pressure chambers (Fig. 5, element 31) are aligned in a plurality of rows each extending in the first direction;

- the plurality of drive electrodes (Fig. 5, element 36) are aligned in a plurality of rows each extending in the first direction in correspondence with the pressure chambers (Fig. 5, element 31);
- the protruding portions of the drive electrodes (Fig. 5, element 36) protrude outward beyond the pressure chambers in the second direction;
- the common electrodes (Fig. 5, element 37) are band-shaped common electrodes extending in the first direction; and

- the plurality of dummy drive electrodes (Fig. 5, element 37) are aligned in the first direction along both sides of the band-shaped common electrodes except the one of the common electrodes (Fig. 5, element 38) closest to the cavity unit (Fig. 5, element 32).

With respect to claim 5, Sakaida discloses a cavity unit (Fig. 5, element 32) that is attached to one of the second sheet members (Fig. 5, element 33B).

With respect to claim 9, Sakaida discloses the sheet members (Fig. 4, elements 33A-33C) are piezoelectric ceramic sheets (Column 9, lines 54-58).

With respect to claim 10, Sakaida discloses the drive electrodes (Fig. 4, element 36) located closest to the cavity unit (Fig. 4, element 32) confront the cavity unit with more than one of the sheet members (Fig. 4, elements 33A-33C) interposed between the plural ones of the drive electrodes and the cavity unit.

With respect to claim 11, Sakaida discloses a frame (Fig. 1, element 1) that supports the inkjet head (Fig. 1, element 5).

With respect to claim 12, Sakaida discloses the plurality of pressure chambers (Fig. 5, element 31) are aligned in a first direction perpendicular to the stacked direction;

- each of the drive electrodes (Fig. 5, element 36) has a length greater than the corresponding pressure chamber in a second direction perpendicular to both the first direction and the stacked direction,
- each drive electrode (Fig. 5, element 36) having a protruding portion protruding beyond the pressure chamber in the second direction;

- the sheet members include first sheet members (Fig. 5, element 33A) and second sheet members (Fig. 5, element 33B), each first sheet member being provided with the drive electrodes (Fig. 5, element 36) on a surface, each second sheet member being provided with one of the common electrodes (Fig. 5, element 37) on a surface;
- the actuator further includes a plurality of dummy drive electrodes (Fig. 5, element 37) and conductive members (Fig. 4, electric circuit connections), the plurality of dummy drive electrodes being formed on the surface of each second sheet member, except the second sheet member closest to the cavity unit, and
- corresponding to the protruding portions of the drive electrodes (Fig. 5, element 36), the conductive members extending in the stacked direction to electrically connect the dummy drive electrodes to the corresponding protruding portions;
- and the projected contours of all the drive electrodes (Fig. 5, element 36) including the protruding portions fall within the projected contour of the one of the common electrodes (Fig. 5, element 38) disposed closest to the cavity unit (Fig. 5, element 32) with respect to the stacked direction.

With respect to claim 13, Sakaida discloses the common electrodes (Fig. 4, element 37) have at least one lead-out portion (Fig. 4, electric circuit connections), and

- the actuator (Fig. 4, element 30) further includes a plurality of dummy common electrodes (Fig. 4, element 37) each formed on the surface of each

first sheet member (Fig. 4, element 33A) to correspond to the lead-out portions of the common electrodes (Fig. 4, electric circuit connections),

- the conductive members (Fig. 4, electric circuit connections) extending in the stacked direction to electrically connect the dummy common electrodes to the lead-out portions of the common electrodes.

With respect to claim 14, Sakaida discloses the plurality of pressure chambers (Fig. 5, element 31) are aligned in a plurality of rows each extending in the first direction;

- the plurality of drive electrodes (Fig. 5, element 36) are aligned in a plurality of rows each extending in the first direction in correspondence with the pressure chambers;
- the protruding portions of the drive electrodes (Fig. 5, element 36) protrude outward beyond the pressure chambers in the second direction;
- the common electrodes (Fig. 5, element 37) are band-shaped common electrodes extending in the first direction; and
- the plurality of dummy drive electrodes (Fig.5, element 37) are aligned in the first direction along both sides of the band-shaped common electrodes except the one of the common electrodes closest to the cavity unit.

With respect to claim 15, Sakaida discloses a cavity unit (Fig. 4, element 32) that is attached to one of the second sheet members (Fig. 4, element 33B).

With respect to claim 19, Sakaida discloses sheet members (Fig. 4, elements 33A-33C) that are piezoelectric ceramic sheets (Column 9, lines 54-58).

With respect to claim 20, Sakaida discloses the plural ones of the drive electrodes (Fig. 4, element 36) located closest to the cavity unit (Fig. 4, element 32) confront the cavity unit with more than one of the sheet members (Fig. 4, elements 33A-33C) interposed between the plural ones of the drive electrodes and the cavity unit.

With respect to claim 21, Sakaida discloses the one of the common electrodes (Fig. 5, element 38) disposed closest to the cavity unit (Fig. 5, element 32) confronts the cavity unit with one of the sheet members (Fig. 5, element 40) interposed between the one of the common electrodes and the cavity unit (Column 10, lines 60-67).

With respect to claim 22, Sakaida discloses the projected contour of the one of the common electrodes (Fig. 5, element 38, i.e. rectangular shape) disposed closest to the cavity unit (Fig. 5, element 32) includes a part that traces the projected contours of all the drive electrodes (Fig. 5, element 36, i.e. rectangular shape) with respect to the stacked direction.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 6-8 and 18 are rejected under 35 U.S.C. 103(a) as being obvious over Sakaida (US 6,174,051 B1) in view of Shimada et al. (US 6,378,996 B1).

With respect to claims 6-8 and 18 Sakaida discloses the inkjet head where the cavity unit (Fig. 5, element 32) is attached to one of the second sheet members (Fig.1, element 33B) using an adhesive (Column 6, line 9).

Sakaida fails to disclose through holes penetrating through the portions of the drive electrodes, and a flexible cable.

Shimada discloses "the nozzle plate in which the nozzle orifices are bored is fixed by adhesive agent or the like on the surface of the passage-forming substrate where the piezoelectric elements are formed" (Column 12, lines 21-25), "the lead electrodes and the drive circuit are electrically connected respectively through connection holes provided in a region, which opposes the drive circuit, of the elastic film" (Column 8, lines 42-49), and "on the passage-forming substrate, connection wirings that connect the drive circuit and external wiring such as FPC are formed in the vicinity of the end portion in the direction where the pressure generating chambers 12 are parallelly provided" (Column 17, lines 8-16).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to use the inkjet head features of Shimada in the print head of Sakaida. The motivation for doing so would have been to provide an inkjet recording head that is capable of improving the rigidity of the compartment wall and arranging the pressure generating chambers in high density (Column 2, lines 17-22).

2. Claim 16 is rejected under 35 U.S.C. 103(a) as being obvious over Sakaida (US 6,174,051 B1) in view of Moynihan et al. (US 5,605,659).

Sakaida discloses the inkjet head where the cavity unit (Fig. 5, element 32) is attached to one of the second sheet members (Fig. 5, element 33B).

Sakaida fails to disclose using a non-ink-permeable and electrically insulative adhesive.

Moynihan discloses "an epoxy adhesive can be used to mount not only the piezoelectric plate, but also the orifice plate, to the opposite surfaces of the carbon body. For this purpose, one of the surfaces of the plates to be joined is preferably spray-coated with a layer of B-stage epoxy adhesive about 2 microns thick before the piezoelectric plate 23 or the orifice plate is applied to it" (Column 9, lines 35-60)

At the time of the invention, it would have been obvious to use the adhesive discloses by Moynihan in the print head of Sakaida. The motivation for doing so would have been "such a thin layer of epoxy adhesive provides excellent seals between the plates, including the very narrow portions between the orifice passages, but does not flow into the passages or apertures in such a way as to interfere with the operation of the head" (Column 9, lines 35-60).

3. Claim 17 is rejected under 35 U.S.C. 103(a) as being obvious over Sakaida (US 6,174,051 B1) in view of Utsumi et al. (US 4,766,671).

Sakaida discloses the inkjet printer having sheet members (Fig. 4, elements 33A-33C).

Sakaida fails to disclose through holes penetrating through the protruding portions of the drive electrodes and the dummy drive electrodes, the through holes

being filled with conductive past, the conductive past serving as the conductive members.

Utsumi discloses "the connections of the electrodes are performed along the stacking direction as follows. Through holes are formed at the centers of the terminals so as to extend through the ceramic layers. Before or after the laminated body of the ceramic layers is sintered, a conductive paste is filled in the through holes" (Column 15, lines 25-31).

At the time of the invention, it would have been obvious for one of ordinary skill in the art to use the through holes disclosed by Utsumi in the print head of Sakaida. The motivation for doing so would have been to achieve electrical connection of the electrodes (Column 15, lines 15-31).

Response to Arguments

The examiner makes of record that the previous specification and claim objections dated 23 March 2005 are withdrawn in view of applicant's remarks.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is 571 272-2810. The examiner can normally be reached on 7am - 330pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GSM
10/7/2005

GM

10/12/05

MANISH S. SHAH
PRIMARY EXAMINER